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APPLICATIONS SATELLITES: LEGAL ASPECTS (PART 2)

THE REMOTE SENSING OF EARTH RESOURCES BY SATELLITES

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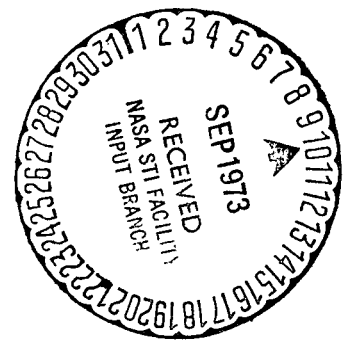

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APPLICATIONS SATELLITES:
LEGAL ASPECTS

(PART 2)

THE REMOTE SENSING OF EARTH RESOURCES BY SATELLITES

A. Tchernonog *

A satellite remote sensing system consists of a part in space and a part on the ground. /1**

— Remote sensing satellites on polar orbits, such as the American Satellite ERTS-1 launched in July, 1972. These have transducers which have a resolving power on the ground of a few tens of meters;

— Ground stations which receive the data obtained by remote sensing for data processing, storage and distribution to the users.

There are many advantages of such a system:

— Observations of extended geographical areas, (several millions of square kilometers).

— A very flexible method of utilization. Observations can be performed at regular intervals of predetermined areas, so that changing phenomena can be studied (scanning satellites). Constant observation of the region (geostationary satellites).

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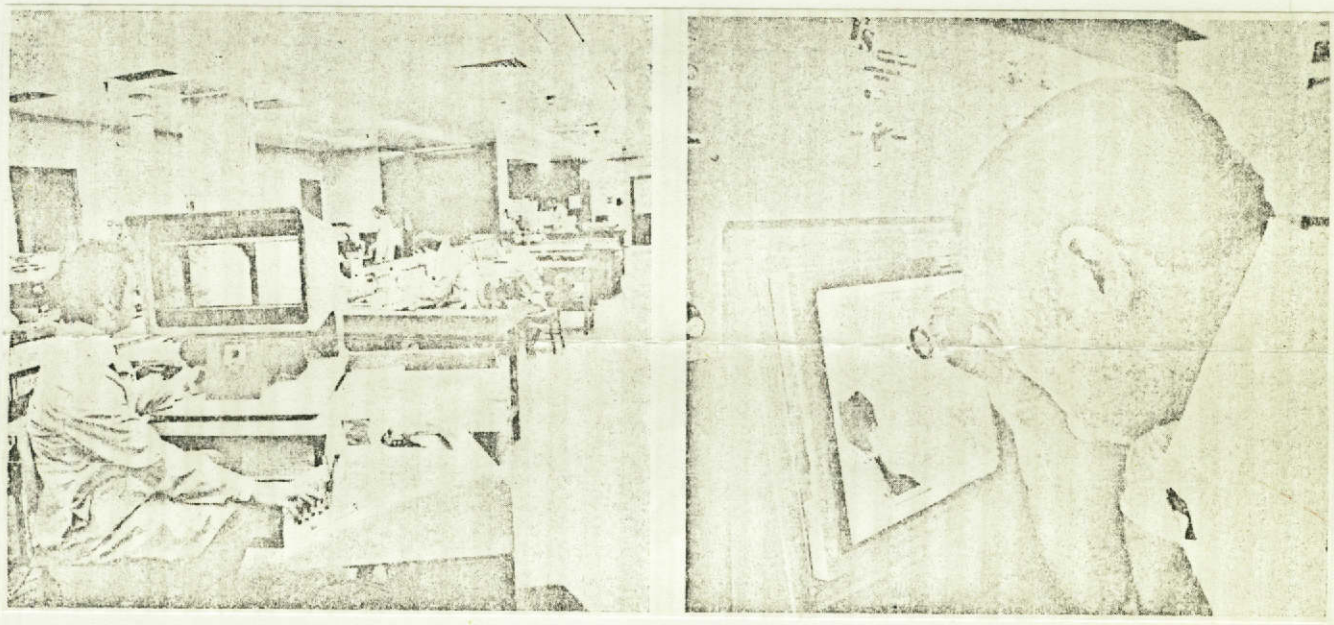
** Numbers in the margin indicate pagination of original foreign text.

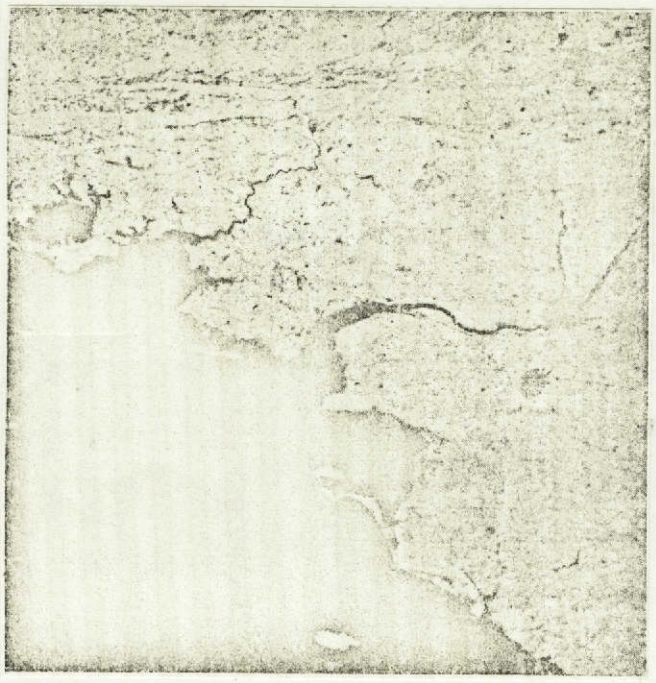


The NDPF (Nasa Data Processing Facility) was built by NASA for verifying the quality of the data and photographs transmitted by the ERTS-1. These are then distributed among the various organizations and principal investigators. This center can control 10,000 black and white and colored documents per week. A copy of each photograph is systematically distributed to the earth resource data center at Sioux Falls, to the NOAA, to the Department of Agriculture and more than 300 users (NASA photographs).

— There is a possibility of observing areas which are difficult to reach (oceans, arctic and antarctic regions).

— There is a possibility of obtaining a reduced amount of data per unit of operation.

However, there are certain disadvantages on the economical, /2
political and legal level. For a long time, laws in space were determined by the two largest space powers: the United States and the Soviet Union. This double hegemony was appropriate when space activities were only concerned with space. However,



Fralit (French Atlantic Littoral) is one of the 7 French programs of NASA which will be carried out using the ERTS-1. The main object is to apply remote sensing methods to the littoral ocean areas of France, in particular to the ocean marshes. This photograph shows the soft part of the Armoricain masses and the mouth of the Loire river. It was taken on September 27, 1972 at 10:30 UT by an infrared detector (0.8-1.1μ) using a multispectral sweep system (occupational school for advanced studies of the National Geographic Institute, Poitiers University and NASA).

more and more space activities are supporting activities on the ground (telecommunications, meteorology, aerial navigation, ship navigation, etc.). This means that control of this activity will be of interest to all nations, even the countries which are not space powers. In space, the remote sensing satellites show that material which can be obtained by one nation in space will be of interest to all nations.

Consequently, the development of laws for remote sensing as well as their enforcement must be done within the framework of a large international cooperative effort, and all nations must participate.

Legal areas applicable to remote sensing earth resource satellites.

Remote sensing by satellites is similar to direct radio transmission by satellites in many ways. In both cases, any

activity carried out in space implies a certain number of risks for nations being overflown. The transmission broadcast by the satellites can contain political and commercial propaganda. The data obtained from the remote sensing activity can be monopolized by a country which is technically advanced. This country can then economically exploit a less developed country (mine prospecting, fishing, business strategies). Just as it is necessary to have an international agreement on the use of direct radio broadcasting by satellites, as was expressed by the general assembly of the United Nations [1], it is necessary to have a law which is specifically directed against remote sensing by satellites, since there are not adequate international laws on the subject.

Remote sensing satellites for earth resources and international law.

Remote sensing by satellites makes it possible to obtain information on overflown territories from space outside the atmosphere. Thus there is a problem of the coexistence of the two principles of international law: there is the principle of territorial sovereignty of states under the satellite and the principle of free utilization of space outside the atmosphere.

In reality, the provisions of the space treaty of 1967 resolved this apparent contradiction. Article 1 of the treaty states a principle of freedom in very general terms: "space

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[1] Resolution 2916 (XXVII) of November 9, 1972. See the declaration of guidelines for the use of satellite broadcasting adapted by the general conference of the UNESCO on November 15, 1972.

outside the atmosphere can be explored and freely used by all states"; "scientific research is completely free in the space outside the atmosphere".

However, this freedom cannot be an absolute one: space activities "must obey international law, including the charter of the United Nations, such that international peace and security will be maintained and so as to favor international cooperation and comprehension" (Article III). A certain finality is given because they "must be carried out for the good and in the interest of all countries" (Article I).[1]

International law and therefore the principle of national sovereignty indicated in Article II, paragraph 7 of the United Nations Charter, must control the use of earth resource remote sensing satellites.

The general assembly of the United Nations interpreted the principle of national sovereignty by issuing several resolutions. They have declared that each country can freely exploit its own natural resources [2].

The states therefore have the right to control all aspects of their natural resources (localization, quantity, accessibility) which have been discovered and which remain to be discovered. Any remote sensing activity by satellites must respect the right of each nation under any satellite regarding its natural resources.

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[1] We can also refer to Article IX of the Space Treaty: "the participating states will carry out their activities in the space outside the atmosphere while considering the interests of other treaty states."

[2] The following resolutions are concerned with this law: 626 (VII) of December 21, 1952, 1314 (XIII) of December 12, 1958; 1803 (XVII) of December 14, 1962; 2158 (XXI) of November 25, 1966; 2600 (XXIV) of December 16, 1969; resolution 2962 (XXV).

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These resolutions certainly have an incontestable moral value. Nevertheless, they themselves do not have any obligatory character.[1] This is why many states, in particular states which are developing, are interested in obtaining international conventions which will give a legal context to the principles set forth in the resolutions mentioned above. Other international laws must also be imposed: in particular, the states must agree to the procedure of international telecommunication convention and the radio communication rules, concerning the assignment of frequencies required to be used for remote sensing of earth resources by satellites.

The adaptation by the United Nations of the convention for immatriculation of space objects will make it possible for the states to obtain better information on planned remote sensing activities.

These principles and rules of international law give an indication of conditions under which remote sensing satellites must be used. However, they do not constitute a legal framework which is sufficiently adapted to the control of a new activity.[2]

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[1] "In reality, the permanent sovereignty regarding natural resources is not a rule of international law, but a doctrine", G. Fischer.

[2] Thus, the convention on the responsibility for any damage caused by space objects gives a restrictive definition of the concept of "damages", because of a limitation to material damage (Article I). The economic damage due to abuses of remote sensing satellites could therefore not be based on this convention.

The requirement for a specific regulation of remote sensing activities for earth resources.

The Economic and Social council was the first organ of the United Nations to occupy itself with this question.[1] For this purpose, on July 27, 1970 a "permanent committee of natural resources was organized".

The general assembly assigned the Committee for Peaceful Uses of Outer Space (CUPEEA) the task of studying the problems associated with the use of satellite remote sensing. (Resolution 2600 XXIV of December 19, 1969). In spite of repeated invitations from the general assembly[2] the working group for remote sensing of the earth by satellites only held its first preparation meeting in May, 1972.[3]

Nevertheless it seems, often the occasion of a second meeting of the group[4], that questions associated with remote sensing will be examined with more urgency from now on.

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[1] Resolution 1426 (XLIX) on the valuation of natural resources of June 6, 1960. At the end of this resolution, the general secretary of the United Nations published an important report on "satellites for the study of natural resources" (doc. E/4779 of February 4, 1970).

[2] Resolutions 2733 (XXV) of December 16, 1970 and 2778 (XXI) of November 29, 1971.

[3] This group was created in 1971 by the Scientific and Technical Committee (United Nations Document A/AC.105/C.1/L.42 of July 13, 1971).

[4] Meeting of January 29 and February 9, 1973; document A/AC.105/C.I W.6. 4/L.4.

Among other things, the legal committee has addressed itself to the legal problems associated with this activity.

At this time it is appropriate to outline the various features of an international regulation of the remote sensing activities performed from objects in space.

In this respect it is important to distinguish between space where the data are collected, and the ground where the data are distributed.

Data collection

This is accomplished from space outside of the atmosphere and must therefore benefit from the principle of liberty in space, as indicated in the space treaty. This principle of liberty applies because observations carried out from conventional space flights will not usually provoke protests from the states concerned.

In any reasonable situation, international law prohibits any recourse through force by a state in order to prevent a remote sensing satellite from crossing over its territory. The only coercive measure which could be authorized by international law under certain conditions is jamming. Legally this is called a "non-armed reprisal".

However, the jamming of space signals is a complex and risky operation which only space powers can carry out with any effectiveness. Since this technique introduces a new element of inequality among the states, it is opposed to the desired goal.

If each state has the freedom of pursuing peaceful goals by satellite remote sensing, this freedom must not be detrimental to other states. Certainly if these activities are exclusively concerned with the state performing them, in principle they will not be subjected to any international control.

However, when a state wishes to carry out remote sensing operations above national territories of other states, this state must first communicate all the required information to the states which have jurisdiction over these territories. These latter states cannot oppose the activities unless they can prove that their interests are being compromised. Conversely, they will obtain the right to participate in the activities if they request to do so under equitable and reasonable conditions.

If the planned activity extends over ground and ocean regions which extend beyond national control, the United Nations general secretary must be informed beforehand. Any state has the right to participate under equitable and reasonable conditions, if they request to do so.

The distribution of data

In this case the principle of territorial sovereignty must apply completely. All these states which are overflown must obtain the exclusive right on a priority basis to the data obtained from the activity. If the state responsible for the activity refuses to give access to these data, this may imply that the use to which it puts the information obtained may not conform with the interests of the territorial states.

United Nations must receive all the data which is applicable for areas located outside of the limits of national jurisdiction. They will be sent to a data center which will be

created for this purpose. These data will be utilized in a manner compatible with the declaration of the principles which apply to the ocean floor, as well as the region underneath the ocean floor, outside of the national jurisdiction limits.[1] /4

The main obstacle in the implementation of such international controls are financial. The participation in the remote sensing activities and the access to the data will produce costs for the participating nations, and some of these nations will not be able to finance their participation. This is why the principles established by international control will only be effected if they are established within the framework of a cooperation among institutions.

Establishment of the judicial region applicable to remote sensing satellites for earth resources.

The damages of employing remote sensing satellites can only be exploited by the users if they are capable of managing the data and if they are capable of obtaining useful results from them. However, the acquisition, processing, storage and distribution of data requires very complex and expensive ground stations.[2]

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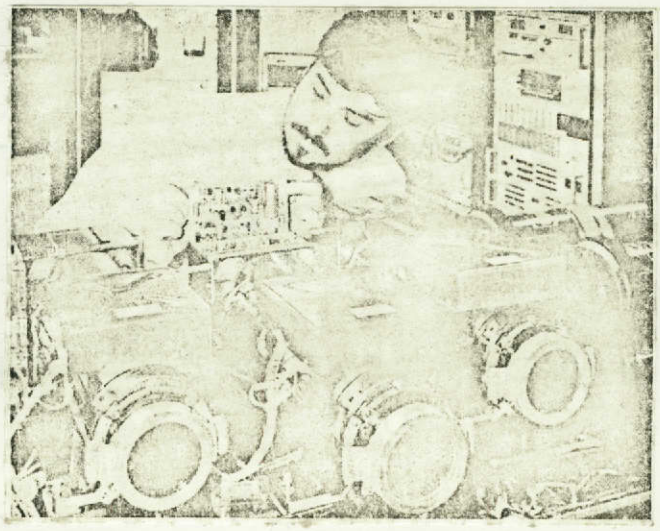
[1] United Nations A-6 (XXV) December 17, 1970.

[2] According to a report of the United Nations General Secretary document Eco/Soc E/4779 of February 4, 1970, the total cost of an operational system is approximately 430 million dollars of which 143 million dollars is for the part in space, and 237 million dollars is for the part on the ground (processing and broadcasting).



The three return-beam vidicon (RBV) system cameras installed on the ERTS-1 are synchronized and mechanically aligned with respect to the vertical at the same location on the earth. (185 x 185 km). It has various filters for a defined spectral range and a vidicon tube with a 25 mm aperture which has a polystyrene film memory. Each of the cameras take a picture every 25 seconds (USIS photograph).

The dominant role played by the United States in the area of remote detection must also be taken into consideration.

The bilateral relationships between countries which generate the data and those which desire to use it must be expanded. Only institutional cooperation will make it possible to establish a certain degree of equality among states.

Establishment within a bilateral framework:
the ERTS (earth resources technology satellite) system

Even though 32 countries are participating in the ERTS-1[1] program, it is not possible to consider it as a multi-lateral

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[1] The satellite ERTS-I was orbited on July 23, 1972. For budget reasons, the launch of a second satellite of this type which was initially scheduled for 1973 has been deferred until 1976.

system: conditions for participation of each country are in reality determined exclusively by the American authorities.

On July 21, 1972 NASA defined its policy regarding experiment results from ERTS-1:

— The documentation service of NASA will receive a copy of all reports written by experimenters which include descriptions of analyses which led to those results;

— These reports will be made public through the National Technical Information Service and will be distributed to all investigators every week;

— There could be no use of publication of these results before these reports have been given to the NASA documentation service.

The purpose of this policy is to give a uniform interpretation of the results obtained from the satellite ERTS. Nevertheless, application of this policy is not compatible with the principles which must control the use of remote sensing technology. This is because the United States will obtain the results of all work performed on territories of foreign states on a priority basis. These results are then freely distributed without any recourse of the states involved to oppose this distribution. The sovereignty of the states regarding their natural resources is therefore lost.

The same results apply to results corresponding to areas which are not subjected to the control of countries: these results should not be first communicated to NASA, but instead to an organ of the United Nations.

Since there is no competent United Nations organ, there is the risk that the principles established by NASA for the ERTS system will be compromised. Consequently, it is very important for the general assembly of the United Nations to create such an organ.[1]

Establishment within a multi-lateral framework

An operational remote sensing system is not planned before 1980. In the meantime, it has been found that an experimental system such as the ERTS system encounters legal and financial problems which can only be solved within a very large international context.

The existence of a coordination group within the organization would make it possible to guarantee the synthesis of the information as a control of use of the information. /5

At the present time, there are no specific groups assigned to the specific problem of remote sensing. We must consider the two features which characterize a satellite remote sensing system: The hardware (i.e. the satellite) and the mission, i.e. the study of the earth's resources. Thus the General Assembly has asked the working group for remote observation of earth resources by satellite to operate while taking into account coordination with the permanent committee for natural resources connected with the Economic and Social Council.

Other organs are also concerned: The consulting committee on the application of science and technology, the United Nations

[1]The United States has made an offer to communicate the information obtained from its satellites to such an organ of the United Nations, if it is ever created.

program for development, and various specialized institutions of the United Nations.

The creation of a coordination center seems to be necessary in the space spector as well as in the ground spector, even though the various organs and institutions exist.

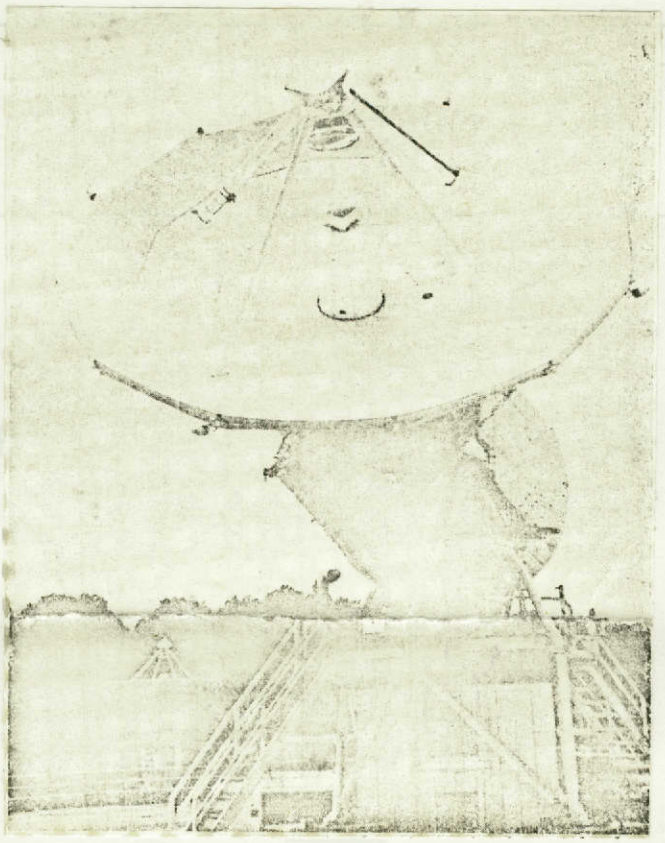
The space sector

For the present time, the working group has decided that the United Nations could not and should not participate in the exploitation of the space sector[1]. Consequently, participation of the states in remote sensing activities would imply recourse to satellites launched by the space towers or by international space organizations.

The space powers operating within agreements made at the United Nations could coordinate their programs in order to take into account the requirements of all foreign states. Another possibility is to create an international organization with a space sector according to the INTELSAT model.

These hypotheses all assume that agreements will be reached regarding programs, areas served and data collection on board the satellite. Any organ of the United Nations must proceed with caution because it must reflect the principle that the contribution of the space sector will be limited to the technical

[1] The United Nations document A/AC.105/C.I/W-L/L.4, February 8, 1973. Report project of the working group for earth remote sensing by satellite in the second session.



Three stations of this type installed in the United States. (Greenbelt, Goldstone and Fairbanks) can receive the photographs taken by the vidicon cameras and the multispectral scanner on the ERTS-1 satellite. The antenna diameter is 10 meters. (NASA photograph).

aspects of remote sensing, and the evaluation of the information is outside of the field of confidence of the state or of the organization which owns the satellite.

The ground sector

The United Nations must first evaluate the resources of the states and their willingness to cooperate in remote sensing activities[1].

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[1] Define the requirements of the states for remote sensing equipment, study the space data already available, and participate in the training of technicians.

Since there is no data center at the United Nations, the countries with ground stations receive the raw data on the territories over which they have jurisdiction. They directly transmit the data to these countries and neither the countries owning the ground stations nor third persons will have access to the data.

Another solution would consist of restricting the raw data to an international organization which would then distribute it to the concerned states.

However, the principle of equality of states will not in reality be respected unless an organization is created under the United Nations which will finance data acquisition and data processing. Any country could then contribute to the interpretation of the data depending on its requirements and its capacity.

It would be possible to establish a system of regional receiving stations which would be capable of processing, storing and distributing these data.[1] International assistance will be provided to the states which ask for it, so that they can exploit the results.

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[1] The regional stations are preferable to world-wide stations, because at the level of a geographic region, the political difficulties can be overcome, the data to be processed is not as expensive, and finally it is easier to distribute the cost proportional to the utilization of the regional installations among each participating country.

The data corresponding to areas on the ground or in the oceans outside of the jurisdiction of states will be transmitted to the data center, which will be run by the United Nations.[1]

This study has shown that, as far as remote sensing is concerned, technology is more advanced than law. The reason for this lack essentially is due to the reluctance of the large space powers to develop controls which would limit the remote sensing activities in a way which would conform to the interests of the non-space powers. However, because remote detection by satellites has substantial consequences for these states, we do not doubt that because of their pressure, international law will have to regulate this activity.

Therefore, we have shown that the consequences on the ground of space activities will not benefit from a degree of freedom such as now exists for purely scientific activities carried out in space outside of the atmosphere.

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[1]The center will establish direct relationships with the specialized institutions and with the natural resource committee.